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ABSTRACT

Situational influences on self-confidence and assertiveness in female and male graduate students in science and engineering were studied, based on responses from 328 Stanford University students (155 males and 173 females). Two dependent variables were used: an index of items measuring an individual's self-confidence in the ability to perform academic and professional work, and an index measuring an individual's sense of personal ability to act assertively in doing academic work. Three independent variables represented potentially supportive aspects of the environment: an index measuring perceptions of the quality of relations with the adviser, an index measuring perceptions of the availability of support from peers and faculty, and a global assessment of the amount of stress experienced in graduate school. Enrollment in a master's or Ph.D. program was also considered. Separate regressions were performed for men and women. The results suggest that women are sensitive to supportive features of the academic environment but fail to generally support such a conclusion about men. The supportiveness of the academic department failed to be a significant predictor. The perceived level of stress in graduate school was the strongest predictor of both assertiveness and self-confidence for women. (SW)

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# The Relationship of the Supportiveness of the Academic Environment to the Self-Confidence and Assertiveness in Academic Work for Men and Women Graduate Students in Science and Engineering

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Despite tremendous increases in the number of women entering science and engineering, the proportion of women students in academic programs in science and engineering is still quite small, compared to programs in the social sciences and humanities (Vetter, 1981; Fisher and Peters, 1979; Baranger, 1976).

Not only do a lower proportion of women choose science as their initial major in college, but the proportion of women in scientific fields declines from the bachelor's degree through the doctoral degree (Grant and Eiden, 1981). Many universities have developed efforts to both attract more women to and retain them in engineering and scientific fields. These efforts take a variety of forms, from exposing women students to more women scientists as potential role models to the formation of peer support groups for women science and engineering students. By and large, the affirmative action efforts are aimed at increasing women students' self confidence and assertiveness rather than at achieving any structural change in scientific training.

People who form a substantial minority within an organization or group face additional pressures that their majority peers do not. Supportive features of the academic environment in scientific fields may be more important to women than men, serving to mitigate the pressures of being in a nontraditional field in low numbers.

Literature Review

The structure of graduate training in science exhbits several features which have been found to discourage women's self confidence. Under experimental conditions, women have exhibited

less self confidence in their work under conditions of 1) the absence of unambiguous feedback on their performance; 2) comparison of their work to others; and 3) tasks on which women are usually considered to fare less well than men (Lenney, 1981; Lenney, 1977). While the subjects in these studies were not confined to those with a particular interest in scientific fields, even women undergraduates in engineering show a similar lack of self confidence in their ability to perform scientific work compared to their male peers, despite an equal or better performance on measures of academic ability (Jagacinski and LeBold, 1981; Ott, 1978).

General research on assertiveness suggests that like self confidence, assertiveness is not an innate trait, but varies with the situation (Sundel and Lobb, 1982; Kolotkin, 1980).

Kanter (1977) outlines exclusionary dynamics that she attributes to being a member of a group in the extreme minority. Although she based her description on men and women managers, some of the dynamics have been found in science as well. The language used in science, the metaphors and imagery, are drawn from what the society considers masculine rather than feminine discourse (Keller, 1978; Hacker, 1981). In some of the subfields of science, having women colleagues or students is such a new experience that generalizations about how "women" will do in the field can only be based on a few cases, placing enormous burdens on the pioneering women.

If situational aspects (as opposed to intrapsychic explanations) are at least partially responsible for women's

lower self confidence and assertiveness, the supportiveness of the academic environment might play a mediating role between the nontraditional context and women's perceptions of their abilities. Supportive interaction with faculty plays an important medicating role between undergraduate women's perceptions of the department and their general satisfaction with their major, especially in nontraditional majors (Hearn and Olzak, 1981).

Procedure

This study utilizes the data from a 1984 survey sent to all female and an equal number of randomly selected male graduate students in the fields of science, engineering and medicine (including the MD and physical therapy programs) at Stanford University. The sample was restricted to U.S. citizens.

Of the 1172 people surveyed, 627 usable surveys were received, yielding a response rate of 54%. Because of differences between the structure of the medical programs and other academic departments, 47 students in the medical program and 35 physical therapy students were excluded from this analysis, leaving 545 subjects. However, medical students pursuing a combined M.D./Ph.D. program were retained. This analysis is restricted to the 328 subjects (155 men and 173 women) for whom complete data on all variables was available.

Two dependent variables were utilized. The first was an index of items measuring an individual's self confidence in the ability to perform academic and professional work, SELFCONF. The second was another index which measured an individual's sense of their ability to act assertively in the process of doing their academic

work, ASSERT. Although many of the items were couched in general terms, they were interwoven with other items which were phrased in terms of an academic context. The likelihood is that students evaluated these items with respect to their studies, and not in terms of general personality traits. SELFCONF, ASSERT, and other indices used in the study were formed by factor analyses which identified clusters of closely related items. (See Table I for a list of items composing the indices).

Three independent variables represented potentially supportive aspects of the environment. ADVREL was an index measuring perceptions of the quality of relations with the advisor. The index SUPPT measured perceptions of the availability of support from peers and faculty. GSSTRESS was a global assessment of the amount of stress experienced in graduate school.

In addition to the independent variables, one control variables was used: a dummy variable (PHD), which controlled for whether the student was in a master's or Ph.D. program.

Measures were entered into a regression equation to assess their independent ability to predict self confidence and assertiveness. Regressions were performed separately for men and for women.

Table I

Self-Confidence [1]

How often do you:

question your ability to handle work?
find criticism hard to accept?
trust your own judgement? (R)
Feel confident in speaking up in class? (R)
fear being wrong in front of your professors and peers?
find few opportunities to ask questions?
fear speaking will reveal your inadequacies?
question if you can make it in your field?

Assertiveness

How often do you:

feel able to say no (R)
have trouble giving criticism
have difficulty sticking up for yourself
let annoyances pile up
feel able to set limits and pace self (R)
feel able to negotiate for needs (R)
find you can handle heated discussions with persons of the same sex (R)

Advisor Relations

How often do you feel:

your advisor promotes your advancement? (R)
free to disagree with your advisor? (R)
your ideas are respected by your advisor? (R)
you know what your advisor thinks of you? (R)

Support

How often do you feel:

the faculty is accessible when you need help? (R)
other students are accessible when needed? (R)
the approval of your peers is important to you? (R)
there is a harmonious spirit in your department or lab? (R)

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1 Responses were coded 1 = always, 2 = often, 3 = sometimes, 4 = rarely, 5 = never. Items whose coding was reversed when calculating the scale are indicated by an (R).

Results

Since the number of subjects used in the two regressions differs slightly, separate tables of zero-order correlations between predictor variables and the dependent variables are presented.

Correlations between assertiveness and other variables are shown in Table II. For both men and women, assertiveness was negatively related to being in a Ph.D. program and positively related to the quality of relations with advisor. Assertiveness was also inversely related to the level of graduate stress (note that higher values mean lower levels of stress).

TABLE II
Zero-Order Correlations between Variables in Regression on Assertiveness[2]

| Variable | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. ASSERT | --- | -.21** | .20** | .11 | .21** |
| 2. PHD | -.17* | --- | .07 | .22** | -.07 |
| 3. ADVREL | .18* | -.04 | --- | .36*** | .12 |
| 4. SUPPT | -.02 | -.09 | .36*** | --- | .06 |
| 5. GSSTRESS | .38*** | -.02 | .17* | .04 | --- |

* $p < .05$
** $p < .01$
*** $p < .001$

2 Men above the diagonal, women below.

Correlations between self confidence and other variables are shown in Table III. Self confidence is negatively related to being in a Ph.D. program for women, but not significantly so for men. It is positively reltaed to the quality of advisor relations for both men and women. For men but not for women, self confidence is positively related to the supportiveness of the departmental climate. For women but not for men, self confidence is inversely related to the strength of the self-reported level of stress.

TABLE III
Zero-Order Correlations between Variables
in Regression on Self Confidence[3]

| Variable | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1. SELFCON | --- | -.04 | .24*** | .21** | .07 |
| 2. PHD | -.31*** | --- | .08 | .19** | -.07 |
| 3. ADVREL | .30*** | -.05 | --- | .37*** | .17* |
| 4. SUPPT | .06 | -.09 | .35*** | --- | .09 |
| 5. GSSTRESS | .40*** | -.08 | .17* | .04 | --- |

* p < .05
** p < .01
*** p < .001

3 Men above the diagonal, women below.

Being in a Ph.D. program is positively correlated with the supportiveness of the departmental climate for men, but not for women. The quality of advisor relations and the supportiveness of departmental clmate are positively correlated for both men and women. The quality of advisor relations is inversely related to the level of stress in graduate school for women, but inconsistent results appear for men.

The regression equations for both self confidence and assertiveness yield similar results for women, but not for men. The two equations explain little of the variance for men, but a moderate amount for women. (See Tables IV and V).

For women, when other variables are controlled, being in a Ph.D. program negatively impacts both self confidence and assertiveness. The same is true with regard to assertiveness, but not self confidence, for men. Similarly, the quality of advisor relations is independently and positively related to both self confidence and assertiveness for women, but is only significantly related to self confidence for men. The self-reported level of stress in graduate school significantly impacts assertiveness when other variables are controlled for both men and women, but only impacts the self confidence of women.

Table IV
Regression on Assertiveness

| Variables | Unstandardized[4] Regression Coefficients Men | Women | Standardized Regression Coefficients Men | Women |
|---|---|---|---|---|
| Constant | 20.50 | 21.48 | | |
| PHD | -1.79*** (.69) | -1.30*** (.50) | -.21*** | -.18*** |
| ADVREL | .14 (.10) | .21*** (.09) | .12 | .19*** |
| SUPPT | .17 (.13) | -.15 (.11) | .12 | -.10 |
| GSSTRESS | .55*** (.24) | 1.10*** (.22) | .18*** | .37*** |
| Adjusted R2 | .09 | .20 | .09 | .20 |
| N | 154 | 170 | 154 | 170 |

*** p < .001

4 Standard errors are in parentheses.

Table IV
Regression on Self Confidence

| Variables | Unstandardized[5] Regression Coefficients | | Standardized Regression Coefficients | |
|---|---|---|---|---|
| | Men | Women | Men | Women |
| Constant | 23.07 | 20.03 | | |
| PHD | -.80<br>(.72) | -2.83***<br>(.68) | -.09 | -.28*** |
| ADVREL | .26***<br>(.10) | .40***<br>(.12) | .23*** | .25*** |
| SUPPT | .17<br>(.13) | -.13<br>(.16) | .11 | -.06 |
| GSSTRESS | .09<br>(.11) | 1.40***<br>(.30) | .03 | .33*** |
| Adjusted R2 | .06 | .26 | .06 | .26 |
| N | 155 | 173 | 155 | 173 |

*** $p < .001$

5 Standard errors are in parentheses.

Discussion

These results suggest that women are sensitive to supportive features of the academic environment and fail to generally support such a conclusion about men.

The significance of the control variable, being in a Ph.D. program, lies in differences in the structure of the two programs. The master's programs are much more structured than the Ph.D. program, where production and defense of a thesis involve managing tremendous uncertainties. Interestingly, the level of stress was not associated with being in a Ph.D. program. The Ph.D. program requires more independent research, which is subject to both inspection by graduate peers (facilitating comparisons of work) and variable feedback from superiors and advisors. These are the conditions under which women's self confidence suffers.

It is interesting that the supportiveness of the academic department failed to be a significant predictor. This is the area in which the greatest number of affirmative action efforts are made in attempting to build a supportive environment for women.

A more effective strategy would seem to be to improve the quality of relations with the advisor, specifically the communication between advisor and advisee. The advisor is a rich potential source of information and guidance. It is commonly known that some faculty members play this role better than others. For women in a nontraditional environment, their advisor may play a crucial role in conveying information that male students learn from their peers or from previous experience. Also, provision of

specific and timely feedback in a student's work may serve to foster a sense of self confidence and an attendant willingness to assert themself.

The perceived level of stress in graduate school was the strongest predictor of both assertiveness and self confidence for women. Qualitative data indicated that for the students in the sample, this stress came from many sources. A few women reported experiencing a misogynist atmosphere in which their competence was constantly challenged. Others reported feelings of exclusion and isolation.

Not all the stresses identified were academic. Women were more likely than men to report having experienced a crisis in a personal relationship during graduate school. Descriptions of the division of household labor indicated that women were assuming more responsibility for housework than their male peers. Women almost universally indicated that they were wrestling with deciding whether and, if so, when to have a family in a field which demanded lengthy and/or sustained attention to their professional work as a signal of commitment.

Most schools are attempting to overcome their misogynistic aspects. Reduction of role conflict reflects a more widespread social problem which will be difficult for academic departments to solve apart from change in other societal institutions.

Conclusion

It is surely true that self-confidence and assertiveness have some impact on the quality of relations with the advisor and the level of stress experienced in graduate school. Unfortunately,

the instruments to conduct an analysis of the reciprocal effects were not available in this data set. However, the results of this analysis are generally consistent with the earlier research on situational influences on self confidence in women and suggest that women's assertive behavior may be influenced similarly.

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